

WHAT IS CLAIMED IS:

1. A method of fabricating an article protected by a thermal barrier coating system, comprising the steps of
  - providing an article substrate having a substrate surface; thereafter
  - producing a flattened bond coat on the substrate surface, the step of producing the flattened bond coat including the steps of
    - depositing a bond coat on the substrate surface, the bond coat having a bond coat surface, and
    - processing the bond coat to achieve a flattened bond coat surface; and thereafter
  - depositing a thermal barrier coating overlying the bond coat surface, the thermal barrier coating comprising yttria-stabilized zirconia having a yttria content of from about 3 percent by weight to about less than 6 percent by weight of the yttria-stabilized zirconia.
2. The method of claim 1, wherein the step of providing the article substrate includes the step of
  - providing the article substrate comprising a nickel-base superalloy.
3. The method of claim 1, wherein the step of providing the article substrate includes the step of
  - providing the article substrate comprising a component of a gas turbine engine.
4. The method of claim 1, wherein the step of depositing the bond coat includes the step of
  - depositing a diffusion aluminide bond coat.
5. The method of claim 1, wherein the step of depositing the bond coat includes the step of
  - depositing a platinum aluminide bond coat.
6. The method of claim 1, wherein the step of processing the bond coat includes the step of
  - flattening the bond coat surface without removing material from the bond coat surface.

7. The method of claim 1, wherein the step of processing the bond coat includes the step of  
peening the bond coat.

8. The method of claim 1, wherein the step of processing the bond coat includes the step of  
peening the bond coat with a peening intensity of from about 6A to about 12A.

9. The method of claim 1, wherein the step of processing the bond coat includes the step of  
flattening the bond coat surface by removing material from the bond coat surface.

10. The method of claim 1, wherein the step of processing the bond coat includes the step of  
polishing the bond coat.

11. The method of claim 1, wherein the step of processing the bond coat includes the step of  
polishing the bond coat by an approach selected from the group consisting of  
tumbling, vibrolapping, and electropolishing.

12. The method of claim 1, wherein the steps of depositing the bond coat and processing the bond coat are performed concurrently.

13. The method of claim 1, wherein the step of processing the bond coat is performed after the step of depositing the bond coat.

14. The method of claim 1, wherein the step of processing the bond coat includes the step of  
producing a bond coat surface having an average grain boundary displacement height of less than about 3 micrometers.

15. The method of claim 1, wherein the step of depositing the thermal barrier coating includes the step of

depositing the thermal barrier coating by physical vapor deposition.

16. The method of claim 1, wherein the step of depositing the thermal barrier coating includes the step of

depositing the thermal barrier coating to have the yttria content from about 3.8 to about 4.2 percent by weight of the yttria-stabilized zirconia.

17. A method of fabricating an article protected by a thermal barrier coating system, comprising the steps of

providing an nickel-base superalloy article substrate comprising a component of a gas turbine engine and having a substrate surface; thereafter

depositing a platinum aluminide bond coat on the substrate surface, the bond coat having a bond coat surface; thereafter

processing the bond coat to flatten the bond coat surface; and thereafter

depositing a thermal barrier coating overlying the bond coat surface, the thermal barrier coating comprising yttria-stabilized zirconia having a yttria content of from about 3 percent by weight to about less than 6 percent by weight of the yttria-stabilized zirconia.

18. An article protected by a thermal barrier coating system, comprising an article substrate having a substrate surface;

a bond coat on the substrate surface, the bond coat having an average grain boundary displacement height of less than about 3 micrometers; and

a thermal barrier coating overlying the bond coat surface, the thermal barrier coating comprising yttria-stabilized zirconia having a yttria content of from about 3 percent by weight to about less than 6 percent by weight of the yttria-stabilized zirconia.

19. The article of claim 18, wherein the article substrate is a nickel-base superalloy.

20. The article of claim 18, wherein the article substrate is a component of a gas turbine engine.

21. The article of claim 18, wherein the bond coat is a diffusion aluminide bond coat.
22. The article of claim 18, wherein the bond coat is a platinum aluminide bond coat.

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